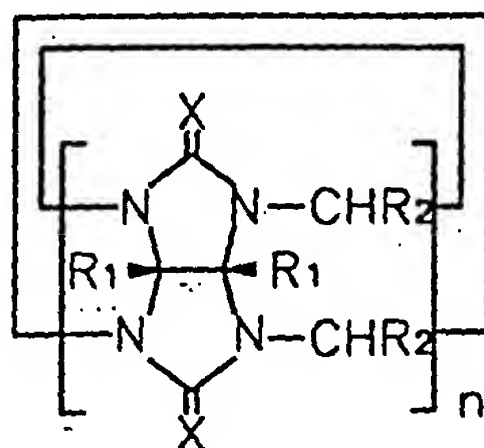


Abstract of the Disclosure

Cucurbituril derivatives, their preparation methods and uses . The cucurbituril derivatives have the formula (1)



where X is O, S or NH; R_1 and R_2 are independently selected from the group consisting of hydrogen, alkyl groups of 1 to 30 carbon atoms, alkenyl groups of 1 to 30 carbon atoms, alkynyl groups of 1 to 30 carbon atoms, alkylthio groups of 1 to 30 carbon atoms, alkylcarboxyl groups of 1 to 30 carbon atoms, hydroxyalkyl groups of 1 to 30 carbon atoms, alkylsilyl groups of 1 to 30 carbon atoms, alkoxy groups of 1 to 30 carbon atoms, haloalkyl groups of 1 to 30 carbon atoms, nitro group, alkylamine groups of 1 to 30 carbon atoms, amine group, aminoalkyl groups of 1 to 30 carbon atoms, unsubstituted cycloalkyl groups of 5 to 30 carbon atoms, cycloalkyl groups of 4 to 30 carbon atoms with hetero atoms, unsubstituted aryl groups of 6 to 30 carbon atoms, and aryl groups of 6 to 30 carbon atoms with hetero atoms; and n is an integer from 4 to 20, wherein the cucurbituril derivatives having the formula (1), where $n=6$, $R_1=H$, $R_2=H$ and $X=O$, and $n=5$, $R_1=CH_3$, $R_2=H$ and $X=O$, are excluded. The cucurbituril derivatives are easily prepared as a mixture by one of the three new methods, and each cucurbituril derivative can be separated from the mixture by fractional crystallization. The cucurbituril derivatives having the formula (1) or their mixtures are very useful in removing dyes and heavy metal ions dissolved in water or waste water.